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Lower Precombat Intelligence Is a Risk Factor for Posttraumatic Stress Disorder

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The authors examined the relation between intelligence and posttraumatic stress disorder (PTSD) by studying the association among precombat intelligence, current intelligence, and self-reported PTSD symptoms. Military aptitude test results were obtained in 59 PTSD and 31 non-PTSD Vietnam combat veterans who had undergone a psychodiagnostic interview and current intelligence testing. People with lower precombat intelligence were more likely to develop PTSD symptoms as assessed by the Clinician-Administered PTSD Scale even after adjustment for extent of combat exposure. The association between current intelligence and PTSD was no longer significant after adjusting for precombat intelligence. These results suggest that lower pretrauma intelligence increases risk for developing PTSD symptoms, not that PTSD lowers performance on intelligence tests.

Intensity of combat exposure is a critical factor in the development of posttraumatic stress disorder (PTSD) in Vietnam veterans. In the National Vietnam Veterans Readjustment Study (NVVRS; Kulka et al., 1990), extent of exposure to war-zone threats remained the best predictor of PTSD symptoms even after controlling for the effects of age, race, socioeconomic status (SES), and premilitary mental health.

Most combat veterans do not develop PTSD (Kulka et al., 1990). Therefore, researchers have begun to study variables that may increase risk for the disorder among individuals exposed to combat. Lower cognitive ability may be one such variable. Lower levels of educational achievement were associated with more PTSD symptoms in the NVVRS (Kulka et al., 1990) and predicted PTSD in another study (Green, Grace, Lindy, Gleser, & Leonard, 1990). Pitman, Orr, Lowenhagen, Macklin, and Altman (1991) found that a lower score on the Arithmetic Reasoning subtest of the Armed Forces Qualification Test (AFQT; Maier, 1993) at military enlistment (or induction) predicted chronic PTSD following combat. The Centers for Disease Control Vietnam Experiences Study (1988) found that the lower a veteran's enlistment (or induction) General Technical score, which is the average of scores on the AFQT's Arithmetic Reasoning and Verbal subtests, the greater the likelihood of his reporting poorer psychologic status after discharge from the military. The rate of PTSD was 65% among Operation Desert Storm (ODS) veterans who performed graves registration duties, and their mean intelligence was 91 (Sutker, Uddo, Brailey, Vasterling, & Errera, 1994).

In a study of the relation between PTSD symptoms and current intelligence (McNally & Shin, 1995), regression analyses indicated that scores on the Combat Exposure Scale (CES; Keane et al., 1989) accounted for 17% of the variance in scores on the Mississippi Scale for Combat-Related PTSD (M-PTSD; Keane, Caddell, & Taylor, 1988). Full-scale intelligence, as estimated by scores on the Shipley Institute for Living Scale (Zachary, 1991), accounted for an additional 10% of the variance in M-PTSD scores. Lower intelligence scores were associated with more severe PTSD symptoms. Although these findings suggest that lower intelligence may be a risk factor for combat-related PTSD, McNally and Shin cautioned that chronic PTSD symptoms (e.g., difficulty concentrating) may have impaired intelligence test performance in these individuals. Finally, studying ODS veterans, Vasterling, Brailey, Constans, Borges, and Sutker (1997) reported a correlation between intelligence and PTSD symptoms ($r = -.37$) nearly identical to that reported by McNally and Shin ($r = -.33$).

Limitations in previous studies make it impossible to deter-

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mine whether lower intelligence in individuals with PTSD was present before the emergence of the disorder or whether it was a consequence of having PTSD. Indeed, precombat measures of cognitive ability were absent in all but two studies; in one of these studies (Pitman et al., 1991), extent of combat exposure was not controlled, and in the other, there was no measure of PTSD (Centers for Disease Control Vietnam Experiences Study, 1988).

The purpose of the present study was to determine whether lower cognitive ability is a risk factor for PTSD symptoms. We endeavored to avoid limitations of previous studies by investigating the relation among precombat intelligence, combat exposure, current PTSD symptoms, and current intelligence in a group of Vietnam combat veterans. Adjustment for combat exposure was important because of the possibility that this factor could confound the link between lower precombat intelligence and PTSD, in light of the military's using aptitude test results to assign military occupational specialty. Less intelligent soldiers may have been especially likely to be assigned to high-combat duty (e.g., infantry) and thereby more likely to develop PTSD. Also, we improved on previous studies of PTSD and intelligence by using an interviewer-administered instrument to assess PTSD symptoms. This instrument allows PTSD to be treated as a continuous variable, determining not only its presence or absence but also its severity.

We hypothesized that (a) lower precombat intelligence would be positively associated with greater combat exposure; (b) after adjusting for combat exposure, lower precombat intelligence would be positively associated with more severe combat-related PTSD; (c) after adjusting for both combat exposure and precombat intelligence, PTSD severity would be negatively associated with current intelligence; and (d) PTSD severity would be positively associated with a decline in performance on intelligence testing from precombat levels.

Method

Participants

Participants were drawn from a pool of 132 U.S. Army and Marine Corps Vietnam combat veterans who had undergone both psychodiagnostic assessment for PTSD and intelligence testing as part of ongoing research at either the Veterans Affairs Medical Center (VAMC) in Manchester, New Hampshire, or the Boston VAMC. We contacted the National Personnel Records Center in St. Louis, Missouri, for copies of the precombat aptitude test results from these veterans' military personnel records. Data were received for 90 (68%) participants: 51 from Manchester and 39 from Boston. Reasons for not receiving data for the remaining 42 individuals included the following: identifying number unavailable, 3; personnel record located elsewhere, 12; personnel record not found, 16; and aptitude test results not found in personnel record, 11. Twelve of the 90 participants had been included in a previous report of the contents of veterans' precombat service medical and personnel records (Pitman et al., 1991), and 13 had been included in a previous report of current intelligence and PTSD (McNally & Shin, 1995).

After complete descriptions of the study's procedures, participants gave written informed consent for participation. However, our institutional review boards exempted participants' consent for access to their precombat aptitude test results on the condition that individual participant's data remain confidential.

Psychodiagnostics

The Clinician-Administered PTSD Scale (CAPS; Blake et al., 1995) had already been administered to each participant by a doctoral-level clinician. In addition to determining a categorical PTSD diagnosis, the CAPS assesses the frequency and intensity of each of the 17 PTSD symptoms on a 0–4 Likert-type scale; summing the frequency and intensity ratings for all symptoms yielded a continuous measure of PTSD in the form of a total CAPS score (possible range of scores: 0–136). Each participant had also completed the CES (Keane et al., 1989; data missing for 1 participant; possible range of scores: 0–41).

Intelligence Testing

Prior to deployment to Vietnam, each participant had taken the AFQT. As noted previously, the AFQT's General Technical score represents the average of scores on the Arithmetic Reasoning and Verbal subtests, which are standardized scores with a mean of 100 and a standard deviation of 20 (Maier, 1993). As Herrnstein and Murray (1994) observed, the AFQT is one of the better measures of general intelligence; it predicts educational attainment even after controlling for SES, and its median correlation with other mental tests is .81. For such reasons, the AFQT's General Technical score was used as a measure of intelligence in the Centers for Disease Control Vietnam Experiences Study (1988). Accordingly, we used the General Technical score as a precombat intelligence measure in the present study.

Each participant recently had undergone intelligence testing at either the Manchester or Boston VAMC. Forty-one Manchester participants were administered six subscales (Digit Span, Vocabulary, Arithmetic, Picture Completion, Picture Arrangement, and Block Design) of the Wechsler Adult Intelligence Scale—Revised (WAIS–R; Wechsler, 1981), from which WAIS–R full-scale intelligence was estimated. The remaining 10 Manchester participants and all 39 Boston participants were administered the Shipley Institute of Living Scale (Zachary, 1991). We used this instrument's conversion table to convert scores on the Shipley to estimated WAIS–R full-scale intelligence. Because the Shipley reliably predicts WAIS–R full-scale intelligence (Zachary, 1991), the intelligence estimates from the WAIS–R and Shipley were treated as equivalent measures of what is subsequently labeled *current intelligence*.

Results

Relative to the 31 healthy combat veterans, the 59 veterans with PTSD were younger, $t(87) = 2.1$, $p = .04$; had completed fewer years of education, $t(88) = 2.3$, $p = .02$; had higher total CAPS scores (i.e., more severe PTSD symptoms), $t(88) = 15.5$, $p < .001$; had higher CES scores (i.e., had been exposed to more combat), $t(87) = 6.0$, $p < .001$; had lower precombat intelligence, $t(88) = 3.8$, $p < .001$; and had lower current intelligence, $t(88) = 2.9$, $p = .004$. The means and standard deviations are presented in Table 1.

The correlation between precombat General Technical scores and CES scores was $r(87) = -.29$, $p = .006$. This indicates that lower precombat intelligence was a risk factor for exposure to more severe combat. Not surprisingly, the higher a participant's CES score, the more severe were his PTSD symptoms as measured by the CAPS; that is, higher combat exposure was a risk factor for PTSD, $r(87) = .59$, $p < .001$. Especially notable was the significant negative correlation between precombat intelligence (General Technical score) and PTSD severity (total CAPS score), $r(88) = -.45$, $p < .001$, which remained significant even after adjusting for combat exposure,

Table 1
Psychometric and Other Descriptive Data for Veterans With Posttraumatic Stress Disorder (PTSD) and for Healthy Veterans

Variable	PTSD	Non-PTSD
Mean age (years)	49.0	50.0
SD	2.4	2.9
Mean education (years)	13.7	15.2
SD	3.1	2.5
Mean CAPS score	70.7	8.8
SD	20.7	10.7
Mean CES score	29.6	16.9
SD	8.9	10.7
Avg. intelligence (precombat)	106.3	119.0
SD	16.0	13.3
Avg. intelligence (current)	101.4	109.5
SD	12.0	13.4

Note. CAPS = Clinician-Administered PTSD Scale (total score); CES = Combat Exposure Scale; Avg. = average.

$pr(86) = -.33$, $p = .002$. For a given amount of combat exposure, persons of lower precombat intelligence were more likely to develop PTSD symptoms following combat.

Although there was a significant negative association between current intelligence and PTSD symptoms, $r(88) = -.37$, $p < .001$, this correlation was not significant after adjusting for precombat intelligence: $pr(87) = -.15$, $p = .17$. These results do not support a contribution of current intelligence to PTSD beyond that already made by precombat intelligence.

The correlation between precombat and current intelligence was $r(88) = .60$, $p < .001$. As shown in Table 1, mean current intelligence was somewhat lower than mean precombat intelligence for both groups. Because the two intelligence measures were not identical, we did not interpret this as indicative of an absolute decline in intelligence. However, the difference score obtained by subtracting precombat intelligence from current estimated intelligence was useful as a relative measure of change in intelligence to test the hypothesis that severity of PTSD would be associated with a decline in performance on intelligence testing from the precombat level. Correlational analyses indicated no significant association between the intelligence difference scores and PTSD symptoms for either the zero-order, $r(88) = .18$, $p = .09$, or partial (adjusted for combat exposure), $r(86) = .12$, $p = .25$, correlations. To control for discrepancies in the precombat and current measures of intelligence, we separately converted the precombat and current intelligence scores to z scores and then calculated the difference between each participant's z scores. The correlation between these difference scores and PTSD severity was also nonsignificant for both the zero-order and partial (adjusted for combat exposure) correlations, $r(88) = .08$, $p = .43$, and $r(86) = .06$, $p = .60$, respectively. These results suggest that chronic PTSD symptoms do not lower performance on intelligence tests. Inspection of the data revealed that the pattern of results for the CAPS total score held for each of the four PTSD symptom clusters assessed by the CAPS (i.e., reexperiencing, avoidance, numbing, and arousal) to comparable extents, suggesting that precombat intelligence was associated with all aspects of the self-reported PTSD syndrome.

Discussion

This study clarifies the relation between intelligence and combat-related PTSD. For a given amount of combat exposure, people with lower intelligence are more likely to develop PTSD than are those with higher intelligence. There are several possible explanations for this finding.

Subjective appraisal of danger is a crucial link between an event and the emotional reaction to it, and this appraisal includes an estimate of one's coping ability. People of lower intelligence may believe they have fewer coping resources and consequently may be more likely to feel overwhelmed and helpless, thereby increasing their risk of PTSD.

Individuals with more cognitive resources also may be better able to cope with the emotional impact that war-zone exposure has already had on them (Schnurr, Rosenberg, & Friedman, 1993). The ability to put a traumatic event into words (Pennebaker, 1993) and to assign meaning to it (Başoğlu et al., 1994) reduces its adverse emotional impact.

Our results do not support the hypothesis that PTSD symptoms reduce performance on intelligence tests; there was no significant correlation between severity of PTSD symptoms and difference between precombat and current intelligence. Furthermore, the relation between current intelligence and PTSD symptom severity lost its significance after we adjusted for the contribution of precombat intelligence.

There is evidence suggesting that preservice psychopathology is a risk factor for combat-related PTSD (e.g., Kulka et al., 1990). Therefore, one might argue that lower precombat intelligence is merely a proxy for undetected preservice psychopathology and that our findings merely demonstrate that (unmeasured) preservice psychopathology predicts postservice psychopathology. We believe this argument to be specious for several reasons. First, psychopathology is not invariably linked to lower intelligence. For example, certain anxiety (e.g., obsessive–compulsive disorder; Rachman & Hodgson, 1980) and mood (e.g., bipolar II; Donnelly, Murphy, Goodwin, & Waldman, 1982) disorders are associated with higher, not lower, levels of intelligence. Second, although childhood conduct disorder is linked to lower intelligence, longitudinal data suggest that neurocognitive problems are a risk factor for conduct problems, not vice versa (Moffitt, 1993). Third, if (undetected preservice) psychopathology is capable of lowering intelligence, one would have expected that PTSD-related psychopathology would produce an additional decline in intelligence. Contrary to this hypothesis, we found no association between PTSD symptom severity and intelligence change. Fourth, on statistical grounds alone, such an argument is implausible because it requires an unrealistically high correlation between precombat intelligence and psychopathology. That is, if precombat intelligence were nothing but an imperfect surrogate measure of psychopathology, then the correlation between precombat intelligence and precombat psychopathology would have to be greater than the correlation between precombat intelligence and PTSD (i.e., greater than $r = -.45$). But the correlation between intelligence and severity of conduct disorder is not nearly this large (e.g., $r = -.22$; Lynam, Moffitt, & Stouthamer-Loeber, 1993).

Because we did not have a measure of SES, is it possible that our results are a spurious consequence of lower precombat intelligence functioning as a proxy of lower premilitary SES? We think not for two reasons. First, recent longitudinal data indicate that bright children do better on a wide range of SES outcomes (e.g., educational attainment and income) than do their less bright siblings (Murray, 1997) thus implying that SES is more a function of intelligence than vice versa. Such studies control for SES confounds in that children reared in the same family share the same SES. Second, most Vietnam combat veterans came from working-class backgrounds. Statistical range restriction on SES variables limits the extent to which such variables can account for findings such as ours.

The present study has several limitations. The participants were not randomly selected from the entire population of Vietnam combat veterans, and the study group was not especially large. Also, it would have been desirable to have a single measure of intelligence for both precombat and current assessment points.

Taken together, our findings suggest that lower intelligence is a risk factor for developing PTSD in combat veterans. In contrast to most studies on Vietnam veterans whose risk factors for PTSD have been retrospectively assessed (e.g., Kulka et al., 1990), our study prospectively identifies a risk factor for PTSD. Knowledge that lower intelligence is a risk factor for PTSD may have preventive public mental health implications. Trauma-exposed individuals with lower cognitive ability may be targeted for early intervention to prevent the development of psychopathology.

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